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IS 3025 (Part 62) (2006): Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Part 62: Tannins (First Revision). ICS 13.060.50

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जल और अपशिष्ट जल के नमूने लेने तथा परीक्षण (भौतिक एवं रसायनिक) की पद्धतियाँ

भाग 62 टेनिंस

(पहला पुनरीक्षण)

Indian Standard

METHODS OF SAMPLING AND TEST (PHYSICAL AND CHEMICAL) FOR WATER AND WASTEWATER

PART 62 TANNINS

(First Revision)

ICS 13.060.50

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2006 **Price Group 2**

Environment Protection and Waste Management Sectional Committee, CHD 32

FOREWORD

This Indian Standard (Part 62) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Environment Protection and Waste Management Sectional Committee had been approved by the Chemical Division Council.

The Committee responsible for the formulation of IS 3025 : 1964 'Methods of sampling and test (physical and chemical) for water used in industry' had decided to revise the standard and publish it in separate parts. This standard is one of the different parts under IS 3025 series of standards and supersede clause **55** of IS 3025.

Tannins are more common in surface water supplies and shallow wells. Tannins are produced as water passes through peaty soil and decaying vegetation. It causes the water to have a yellow or light brown colour and can provide a bitter taste.

There is no ISO Standard on the subject. This standard has been prepared based on the indigenous practices prevalent in the field in India.

The Committee responsible for the formulation of this standard is given at Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

METHODS OF SAMPLING AND TEST (PHYSICAL AND CHEMICAL) FOR WATER AND WASTEWATER

PART 62 TANNINS

(First Revision)

1 SCOPE

This standard prescribes the following two methods of test for determination of tannins in water and wastewater:

a) Colorimetric method, and

b) Spectrophotometric method.

In case of dispute, spectrophotometric method shall be the referee method.

2 REFERENCES

The standards listed below contain provisions which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
3025 (Part 1) : 1986	Methods of sampling and test (physical and chemical) for water and wastewater: Part 1 Sampling (*first revision*)
7022 (Part 1) : 1973	Glossary of terms relating to water, sewage and industrial effluents, Part 1
7022 (Part 2) : 1979	Glossary of terms relating to water, sewage and industrial effluents, Part 2

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 7022 (Part 1) and IS 7022 (Part 2) shall apply.

4 SAMPLING AND PRESERVATION

Sampling and sample preservation shall be done as prescribed in IS 3025 (Part 1).

5 COLORIMETRIC METHOD

5.1 Principle

Tannins reduce phosphomolybdic and phosphotungstic acid to give a blue colour which is matched against that produced with a series of standard tannin solutions.

5.2 Interference

Any substance able to reduce Folin-Dennis reagent will produce a false positive response. Organic chemicals known to interfere include hydroxylated aromatics, proteins, fructose and amines. Inorganic substances known to interfere include iron (II), manganese (II), nitride, cyanide, bisulphite, sulphide, hydrazine and hydroxylamine. Both 2 mg Fe(II)/litre and 125 mg Na_2SO_3/ litre individually produces a colour equivalent to 1 mg tannic acid/ litre.

5.3 Apparatus

5.3.1 *Nessler Tubes* — 50 ml capacity.

5.4 Reagents

5.4.0 *Purity of the Reagents* — Unless specified otherwise, only pure chemicals and tannin free distilled water shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

5.4.1 *Folin-Dennis Reagent* — Add 100 g of sodium tungstate, 10 g of phosphomolybdic acid and 50 ml of phosphoric acid (sp gr 1.75) to 750 ml of distilled water. Boil gently for 2 hours, cool and dilute to 1 litre.

5.4.2 *Sodium Hexametaphosphate Solution* — 25 percent (*w/v*).

5.4.3 *Sodium Carbonate Solution* — 15 percent (*w/v*).

5.4.4 *Standard Tannin Solution* — Dissolve 1.000 g of tannin in about 80 ml of distilled water and make to 100 ml in a graduated flask. Just before use, dilute 10 ml of the solution again to 1 litre. One ml of the diluted solution is equivalent to 0.1 mg of tannin.

5.5 Procedure

Measure 25 ml of the sample into a Nessler tube. Add 1 ml of Folin-Dennis reagent, mix well. Add 2 ml of hexametaphosphate solution, mix and allow to stand for 5 min. Add 20 ml of sodium carbonate solution, mix and allow to stand for a further 10 min. Into ten Nessler tubes, measure 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, and 2.50 ml of standard tannin solution. Dilute each to 25 ml with distilled water. Treat all the ten standard solutions and one blank having 25 ml of distilled water in the same manner as the sample. Compare the colour of the test solution with the colour of the standards.

5.6 Calculation

$$\text{Tannins, mg/l} = 1\,000\,\frac{W}{V}$$

where

W = amount of tannin in the Nessler tube matching the colour obtained with the sample, in mg; and

V = Volume of the sample taken for the test, in ml.

6 SPECTROPHOTOMETRIC METHOD

6.1 Principle

Tannins reduce phosphomolybdic and phosphotungstic acid to give a blue colour which is matched against that produced with a series of standard tannin solutions. This method is generally suitable for the analysis of any organic chemical that will react with Folin-Phenol reagent to form measurable blue colour at the concentration of interest.

6.2 Range and Applicability

This method is suitable for estimation of tannin up to 9 mg/litre minimum detection limit of this method is 0.1 mg/litre tannic acid.

6.3 Interference

See **5.2**.

6.4 Apparatus

6.4.1 *Spectrophotometer*, for use at 700 nm, having a light path of 1 cm.

6.5 Reagents

6.5.0 *Purity of the Reagents*

See **5.4.0**.

6.5.1 *Folin-Phenol Reagent* — Transfer 100 g sodium tungstate, $Na_2WO_4.2H_2O$, 25 g sodium molybdate, $Na_2MoO_4. 2H_2O$, together with 700 ml distilled water to a 2 000 ml flat bottom boiling flask. Add 50 ml 85 percent H_3PO_4 and 100 ml concentrated Hydrochloric acid. Connect to a reflux condenser and boil gently for 10 h. Add 150 g Li_2SO_4, 50 ml distilled water, and a few drops of liquid bromine. Boil without condenser for 15 min to remove excess bromine. Cool to 25°C. Dilute to 1 litre and filter. Store the solution which should have no greenish tint, in a tightly stoppered bottle to protect against reduction by air borne and organic materials.

NOTE — Commercially prepared Folin-Phenol reagent may be used before the recommended expiration date.

6.5.2 *Carbonate Tartarate Reagent* — Dissolve 200 g Na_2CO_3 and 12 g sodium tartarate $Na_2C_4H_4O_6.2H_2O$, in 750 ml hot distilled water, cool to 20°C and dilute to 1 litre.

6.5.3 *Stock Solution* — The nature of the substance present in the sample dictates the choice of chemical used to prepare the standard, because each substance produces different colour intensity.

Weigh 1.000 g tannin. Dissolve in distilled water and dilute to 1 000 ml.

NOTES

1 Tannin is not individual chemical species of known molecular weight and structure. Their chemical properties depend on source and method of isolation. If a particular substance is being added to the water use it to prepare the stock solution. 1 ml of this stock solution = 1 mg active ingredient.

2 If the identity of the compound in the water sample is not known, use phenol and report results as Substance reducing Folin-Phenol reagent in mg phenol/l.

6.5.4 *Standard Solution* — Dilute 10 ml or 50 ml stock solution to 1 000 ml with distilled water. 1.00 ml of this standard solution equal to 10.0 or 50.0 µg active ingredient.

6.6 Procedure

Bring 50 ml portions of clear sample and standard solution to a temperature above 20°C and maintain within ± 2°C range. Add in rapid succession 1 ml Folin-Phenol reagent and 10 ml carbonate-tartarate reagent. Allow 30 min for colour development. Compare visually against simultaneously prepared standard in match Nessler tubes or make photometric reading against a reagent blank prepared at the same time at the wave length of 700 nm.

6.7 Calculation

Plot the calibration curve concentration *vs*. absorbance at 700 nm and find the slope of the best fit line. Using the slope find the concentration of tannin in the sample, in mg/litre.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Environment Protection and Waste Management Sectional Committee, CHD 32

Organization	*Representative(s)*
In personal capacity (*40/14, C.R. Park, New Delhi-110019*)	Prof Dilip Biswas (***Chairman***)
Bhabha Atomic Research Centre, Mumbai	Dr (Shrimati) G. G. Pandit Dr I. V. Saradhi (*Alternate*)
Bharat Heavy Electricals Limited, Hardwar	Dr N. G. Shrivastava
Cement Manufacturers' Association, New Delhi	Dr K. C. Narang
Central Fuel Research Institute, Dhanbad	Dr L. C. Ram
Central Leather Research Institute, Chennai	Dr S. Rajamani
Central Pollution Control Board, New Delhi	Dr S. D. Makhijani Dr C. S. Sharma (*Alternate* I) Dr S. K. Tyagi (*Alternate* II)
Confederation of Indian Industries, New Delhi	Shri A. K. Ghose Shri R. P. Sharma (*Alternate*)
Crop Care Federation of India, New Delhi	Shri P. N. Parmeshwaran
Indian Institute of Technology, Department of Civil Engineering, New Delhi	Dr Mukesh Khare Dr Atul Mittal (*Alternate* I) Dr Arvind Nema (*Alternate* II)
Delhi College of Engineering, Delhi	Dr Rakesh Mehrotra Shri V. K. Minocha (*Alternate* I) Dr (Shrimati) A. Mandal (*Alternate* II)
Directorate General of Factory Advice Service and Labour Institute, Mumbai	Shri S. S. Gautam Shri Brij Mohan (*Alternate*)
Directorate General of Health Services, New Delhi	Dr (Shrimati) Madhuri Sharma
Engineers India Limited, New Delhi	Shri B. B. Lal Shri Susheel Sadh (*Alternate*)
Envirotech Instruments Private Limited, New Delhi	Shri Rakesh Agarwal Dr Rajendra Prasad (*Alternate*)
Federation of Indian Chambers of Commerce & Industry (FICCI), New Delhi	Ms Antara Roy
Gujarat Pollution Control Board, Ahmedabad	Shri D. C. Dave
Hindustan Lever Limited, Mumbai	Shri B. B. Dave Shri Aditya Jhavar (*Alternate*)
Indian Chemical Manufacturers' Association, Mumbai	Shri V. N. Das Shri A. A. Panjwani (*Alternate*)
Indian Council of Agricultural Research, New Delhi	Dr R. C. Maheshwari
Indian Council of Medical Research, New Delhi	Dr H. N. Saiyad
Indian Oil Corporation Limited, Faridabad	Dr M. P. Singh
IPCL, Vadodara	Shri Anupam Desai Shri Mihir Banerji (*Alternate*)

Organization	*Representative(s)*
Industrial Toxicology Research Centre, Lucknow	Dr S. K. Bhargava
Ministry of Defencce (R&D), DRDO, New Delhi	Shri J. C. Kapoor
Ministry of Environment & Forests, New Delhi	Representative
Ministry of Non-conventional Energy Sources, New Delhi	Shri Vinod Kumar Jain
Town & Country Planning Organization, Ministry of Urban Development, New Delhi	Shri K. K. Joadder Dr Santosh Vidhya Dharan (*Alternate*)
Municipal Corporation of Greater Mumbai, Mumbai	Deputy City Engineer Civil Deputy Executive Engineer (*Alternate*)
National Institute of Occupational Health (ICMR), Ahmedabad	Dr V. Krishna Murthy Dr A. K. Mukherjee (*Alternate*)
National Environmental Engineering Research Institute, Nagpur	Dr V. I. Pandit Dr Tapan Nandy (*Alternate*)
National Thermal Power Corporation Limited, New Delhi	Shri R. Gopal
NCCBM, New Delhi	Shri M. S. Bhagwat Dr S. N. Pati (*Alternate*)
Reliance Industries Limited, Mumbai	Dr E. Sunderasan Dr U. K. Saroop (*Alternate*)
Shriram Institute of Industrial Research, New Delhi	Shri V. G. K. Nair Dr Jagdish Kumar (*Alternate*)
SGS India Limited, Chennai	Shri S. Ravi
Steel Authority of India Limited, New Delhi	Shri V. M. Shastri Shri K. B. Lal (*Alternate*)
Thapar Centre for Industrial Research & Development, Patiala	Dr Maheshwar Roy Dr S. K. Chakraborty (*Alternate*)
The Fertilizer Association of India, New Delhi	Dr (Shrimati) B. Swaminathan Dr S. Nand (*Alternate*)
BIS Directorate General	Dr U. C. Srivastava, Scientist 'F' and Head (CHD) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri N. K. Pal
Scientist 'E' (Chemical), BIS